

GPS8100-S

**A TI OMAP35X, AM37X and DM37X
Compatible GPS Module**



User Manual

Version 1.1

14th Jan 2014

Copyright Statement:

- Unless otherwise specified, the EDM1070xx series mentioned in this document includes but is not limited to the following products: EDM1070A-01, EDM1070AR-01, EDM1070B-01, and EDM1070BR-01.
- EDM1070xx and its related intellectual property are owned by Shenzhen Embest Technology Co., Ltd.
- Shenzhen Embest Technology has the copyright of this document and reserves all rights. Any part of the document should not be modified, distributed or duplicated in any approach and form without prior written permission issued by Embest Technology Co., Ltd.

Revision History:

Version	Date	Description
1.0	04/10/2012	Original Version
1.1	14/01/2014	Localisation

Table of Contents

1 Product Overview	1
1.1 Introduction	1
1.2 Kit Contents	1
1.3 Board Interfaces	2
1.4 System Block Diagram	2
2 Hardware Features	3
2.1 Product Features	3
3 Hardware Details	4
3.1 Interfaces	4
3.1.1 4 PIN interface	4
3.1.2 3.1.240PIN Interface	5
4 Linux System	8
4.1 Preparation	8
4.1.1 Hardware	8
4.1.2 Software	8
4.2 Start-up methods	8
4.3 Test Steps	9
4.4 Resources Compilation	10
5 WinCE System	11
5.1 Preparation	11
5.1.1 Hardware	11
5.1.2 Software	11
5.2 Start-up methods	11

5.3 Test Steps	12
Appendix 1: GPGGA Parameter Explanation	13
Appendix 2: GPGSV Parameter Explanation.....	15
Appendix 3: GPRMC Parameter Explanation	16
Appendix 4: GPVTG Parameter Explanation.....	17
Appendix 5: GPGSA Parameter Explanation.....	18
Appendix 6: ESD Precautions & Proper Handling Procedures	19
Appendix 7: Technical support & Warranty	20
7.1 Technical support service.....	20
7.2 Maintenance service clause	21
7.3 Basic guidelines for protection and maintenance of LCDs	22
7.4 Value Added Services.....	23

1 Product Overview

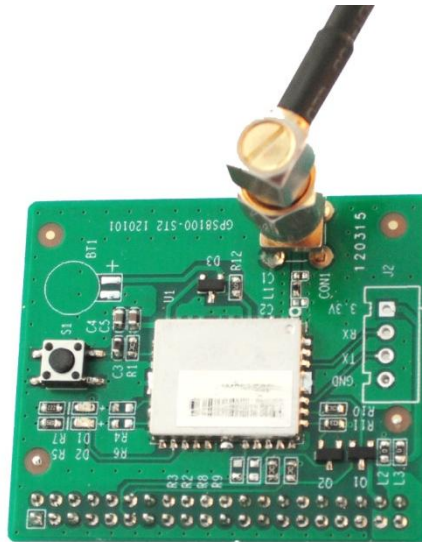


Figure 1: GPS8100-S Module

1.1 Introduction

The GPS8100-S module is a GPS function module designed by Embest Technology. Based on the JRC GPS receiver module G591, which provides the best solution with the highest sensitivity and tracking performance in the world and also features the highest position and speed accuracy in urban conditions.

The GPS8100-S module uses the latest surface mount and advanced integrated circuit technology, which not only obtains the best performance, but also reduces the products size and power consumption. The high-performance hardware and high intelligence software ensure the module has amazing compatibility; it is widely applied to all kinds of guidance products.

1.2 Kit Contents

- ✓ GPS8100-S

1.3 Board Interfaces

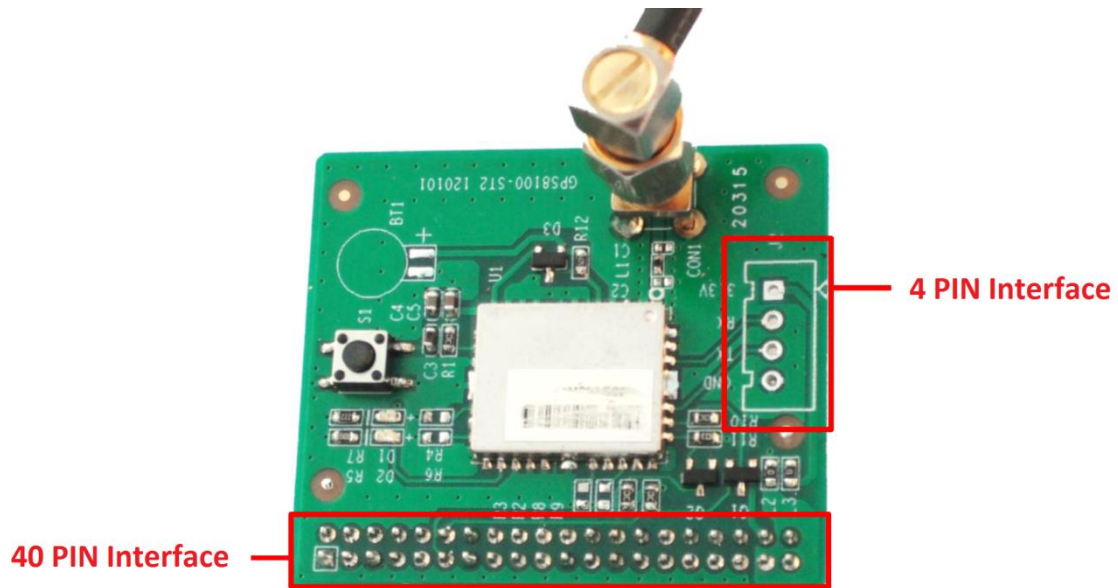


Figure 2: GPS8100-S Interfaces

1.4 System Block Diagram



Figure 3: GPS8100-S System Block Diagram

2 Hardware Features

2.1 Product Features

- L1 band (1575.42MHz) receiver
- Channel: supports up to 88 channels (with 66 search channels and 22 simultaneous tracking channels)
- Chipset: JRC GPS module
- Output data format: NMEA0183 V3.01
- Position accuracy: 3 meters (without Aid)/2.5 meters(DGPS)
- Data Update cycle: One second
- Compatible with: DevKit8000, DevKit8500, SBC8530
- 2.2 Operational Parameters
- Operating Temperature: -40°C ~ 85°C
- Storage Temperature: -40°C ~ 125°C
- Operating Voltage: 1.8V ~ 3.3V
- Dimensions: 38x44 mm
- Cable Length : 5M
- Start time
 - Hot Start (approximately): 1.5 seconds
 - Warm boot (approximately): 34 seconds
 - Cold start (approximately): 35 seconds

3 3 Hardware Details

3.1 Interfaces

3.1.1 4 PIN interface

This interface is used to transmit TTL level GPS data; it can connect to an evaluation board or a PC using RS232 level switching.

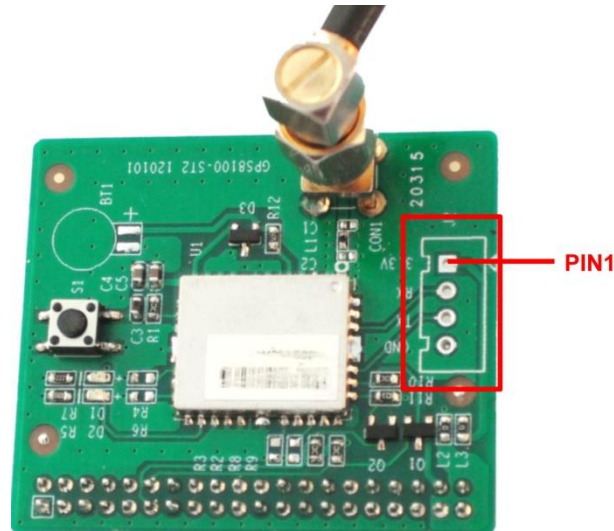


Figure 4: 4 PIN Interface

J2		
Pin	Signal	Function Description
1	VDD3V3	3.3V power
2	TXB	Transmit data, 3.3V, TTL level
3	RXB	Receive data, 3.3V, TTL level
4	GND	GND

3.1.2 3.1.2 40PIN Interface

This interface is used to transmit TTL level GPS data; it can connect to a Devkit8000, Devkit8500, or SBC8530 evaluation board.

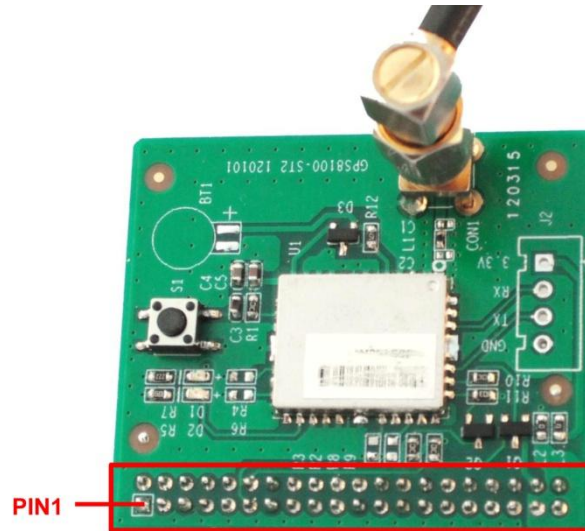


Figure 5: 40 PIN Interface

J1		
Pin	Signal	Function Description
1	GND	GND
2	NC	
3	NC	
4	NC	
5	NC	
6	NC	
7	NC	
8	NC	
9	NC	
10	NC	
11	UART1_RX	UART1 receive data, 1.8V, TTL level

J1		
Pin	Signal	Function Description
12	UART1_TX	UART1 transmit data, 1.8V, TTL level
13	GND	GND
14	NC	
15	NC	
16	NC	
17	NC	
18	NC	
19	NC	
20	NC	
21	NC	
22	NC	
23	NC	
24	NC	
25	NC	
26	NC	
27	NC	
28	GND	GND
29	NC	
30	NC	
31	NC	
32	NC	
33	NC	
34	NC	

J1		
Pin	Signal	Function Description
35	NC	
36	NC	
37	VDD33	3.3V
38	VDD18	1.8V
39	NC	
40	GND	GND

4 Linux System

4.1 Preparation

This section contains a guide to configuring the GPS8100-S for a compatible board. The following hardware and software is required:

4.1.1 Hardware

- Target board (DevKit8000, DevKit8500, SBC8530)
- GPS8100-S module
- GPS antenna
- TF card
- 5V power adapter
- Serial cable

4.1.2 Software

- Image (Target board\linux\image\)
- Testing tools (Package-GPS8100-S\linux\test-gps)

4.2 Start-up methods

1. Connect the serial cable to the PC and the target board.
2. Connect the GPS8100-S module to the expansion interface of the target board.
3. Connect the GPS antenna to the COM1 interface.
4. Copy the file test-gps (Package-GPS8100-S\linux\) to the TF card, and then insert it into the target board.
5. Power on the board.

4.3 Test Steps

1. Run the Linux system then launch the program test-gps from the TF card.

For the DevKit8000 evaluation board, run the following commands to launch the GPS8100-S module:

```
root@DevKit8000:/# /media/mmcblk0p1/test-gps -d /dev/ttyS0 -b 9600
```




For the Devkit8500 evaluation board, run the following commands to launch the GPS8100-S module:

```
root@DevKit8500:/# /media/mmcblk0p1/test-gps -d /dev/ttyS0 -b 9600
```

For the SBC8530 evaluation board, run the following commands to launch the GPS8100-S module:

```
root@SBC8530:/# /media/mmcblk0p1/test-gps -d /dev/ttyS1 -b 9600
```

Note:


-  When executing commands, please refer to the relevant manual of your target board, and select the UART port.
-  Both DevKit8000 and DevKit8500 use UART1 (ttyS0) as their expansion interface
-  The SBC8530 uses UART2 (ttyS1) as its expansion interface

2. The HyperTerminal window will display the following information after executing the command from step 1.

```
ctrl + c to exit!
$GPGSA,A,3,03,06,19,23,,,,,,,,,4.1,4.0,1.0*3E
$GPGSV,3,1,12,25,79,244,,07,68,311,,11,62,180,18,19,44,025,20*70
$GPGSV,3,2,12,08,29,323,18,13,26,226,,03,22,043,36,06,13,046,21*77
$GPGSV,3,3,12,23,12,191,28,28,09,301,,16,03,095,,20,03,173,*76
$GPRMC,012345.000,A,2234.2758,N,11408.0677,E,0.00,,261109,,,A*79
$GPVTG,,T,,M,0.00,N,0.0,K,A*13
$GPGGA,012346.000,2234.2758,N,11408.0677,E,1,04,No data
4.0,69.0,M,-1.7,M,,0000*7F
```

```
$GPGSA,A,3,03,06,19,23,,,,,,,,,4.1,4.0,1.0*3E
$GPRMC,012346.000,A,2234.2758,N,11408.0677,E,0.00,,261109,,,A*7A
$GPVTG,,T,,M,0.00,N,0.0,K,A*13
$GPGGA,012347.000,2234.2758,N,11408.0677,E,1,04,No data
```

Note:

 Press CONTROL+C to quit the test

More information about GPS parameters is available in the Appendix.

4.4 Resources Compilation

The directory Package-GPS8100-S\linux\ contains the file test-gps.c; the resource compilation is shown as below using the DevKit8000 as an example:

1. Install cross-compilation environment

Insert the DevKit8000 DVD into the computer; execute the following command to extract the cross-compilation tools:

```
cd /media/cdrom/linux/tools
tar xvjf arm-2007q3-51-arm-none-linux-gnueabi-i686.tar.bz2 -C /home/mbest
```

2. Implement cross-compilation


Execute the following command to add the cross compiler tool to the environment variable

```
export PATH=/home/mbest/arm-2007q3/bin:$PATH
```

Copy test-gps.c to the Linux system on the PC; execute the following command to generate an executable image

```
arm-none-linux-gnueabi-gcc test-gps.c -o test-gps
```

Note:

 For other target boards please refer to the relevant documentation

5 WinCE System

5.1 Preparation

This section contains a guide to getting the GPS8100-S working with a compatible board. The following hardware and software is required:

5.1.1 Hardware

- Target board (DevKit8000, DevKit8500, SBC8530)
- GPS8100-S module
- GPS antenna
- TF card
- 5V power adapter
- Serial cable

5.1.2 Software

- Testing tools (Package-GPS8100-S\wince\GPSviewer.rar)

5.2 Start-up methods

1. Connect the serial cable to the PC and the target board.
2. Connect the GPS8100-S module to the expansion interface of the target board.
3. Connect the GPS antenna to the COM1 interface.
4. Extract the file GPSviewer.rar from the directory Package-GPS8100-S\wince\, Copy the folder GPSviewer to the TF card, and then insert the TF card into the target board.
5. Power on the board

5.3 Test Steps

1. Run the system and launch the application GpsViewer.exe (The application is in the Directory "\\Storage Card\\GPSviewer").
2. Configure the application GpsViewer.exe option as below:
 - Select COM1 port;
 - Select baud rate of 9600;
 - Click "GPS"

The application GpsViewer.exe will receive the GPS data after finishing the procedure.

Appendix 1: GPGGA Parameter Explanation

GGA: Essential fix data which provides 3D location and accuracy data.

\$GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4,M,46.9,M,,*47

Where:

GGA	Global Positioning System Fix Data
123519	Fix taken at 12:35:19 UTC
4807.038,N	Latitude 48 deg 07.038' N
01131.000,E	Longitude 11 deg 31.000' E
1	Fix quality: 0 = invalid
	1=GPS fix (SPS)
	2=DGPS fix
	3=PPS fix
	4=Real Time Kinematic
	5=Float RTK
	6=Estimated (dead reckoning)
	(2.3 feature)
	7 = Manual input mode
	8 = Simulation mode
08	Number of satellites being tracked
0.9	Horizontal dilution of position
545.4, M	Altitude, Meters, above mean sea level
46.9, M	Height of geoid (mean sea level) above WGS84

ellipsoid

(Empty field) time in seconds since last DGPS update

(Empty field) DGPS station ID number

*47 the checksum data, always begins with *

Appendix 2: GPGSV Parameter Explanation

GSV: Shows data about the satellites that the unit might be able to find based on its viewing mask and almanac data

\$GPGSV,2,1,08,01,40,083,46,02,17,308,41,12,07,344,39,14,22,228,45*75

Where:

GSV	Satellites in view
2	Number of sentences for full data
1	Sentence 1 of 2
08	Number of satellites in view
01	Satellite PRN number
40	Elevation, degrees
083	Azimuth, degrees
46	SNR - higher is better
	for up to 4 satellites per sentence
*75	the checksum data, always begins with *

Appendix 3: GPRMC Parameter Explanation

RMC: NMEA has its own version of essential GPS PVT (position, velocity, time) data. It is called RMC and will look similar to:

\$GPRMC,123519,A,4807.038,N,01131.000,E,022.4,084.4,230394,003.1,W*6A

Where:

RMC	Recommended Minimum sentence C
123519	Fix taken at 12:35:19 UTC
A	Status A=active or V=Void.
4807.038,N	Latitude 48 deg 07.038' N
01131.000,E	Longitude 11 deg 31.000' E
022.4	Speed over the ground in knots
084.4	Track angle in degrees True
230394	Date - 23rd of March 1994
003.1,W	Magnetic Variation
*6A	The checksum data, always begins with *

Appendix 4: GPVTG Parameter Explanation

VTG - Velocity made good. The GPS receiver may use the LC prefix instead of GP if it is emulating Loran output.

\$GPVTG,054.7,T,034.4,M,005.5,N,010.2,K*48

Where:

VTG	Track made good and ground speed
054.7,T	True track made good (degrees)
034.4,M	Magnetic track made good
005.5,N	Ground speed, knots
010.2,K	Ground speed, Kilometres per hour
*48	Checksum

Appendix 5: GPGSA Parameter Explanation

\$GPGSA,A,3,04,05,,09,12,,,24,,,,,2.5,1.3,2.1*39

Where:

GSA	Satellite status
A	Auto selection of 2D or 3D fix (M = manual)
3	3D fix - values include: 1 = no fix 2 = 2D fix 3 = 3D fix
04,05...	PRNs of satellites used for fix (space for 12)
2.5	PDOP (dilution of precision)
1.3	Horizontal dilution of precision (HDOP)
2.1	Vertical dilution of precision (VDOP)
*39	the checksum data, always begins with *

For more information, please visit:



<http://www.gpsinformation.org/dale/nmea.htm>


Appendix 6: ESD Precautions & Proper Handling Procedures

Please note that the board comes without any case/box and all components are exposed. Therefore, extra attention must be paid to ESD (electrostatic discharge) precautions. To effectively prevent electrostatic damage, please follow the steps below:

- Avoid carpets in cool, dry areas. Leave development kits in their anti-static packaging until ready to be installed.
- Dissipate static electricity before handling any system components (development kits) by touching a grounded metal object, such as the system unit unpainted metal chassis.
- If possible, use antistatic devices, such as wrist straps and floor mats.
- Always hold an evaluation board by its edges. Avoid touching the contacts and components on the board.
- Take care when connecting or disconnecting cables. A damaged cable can cause a short in the electrical circuit.
- Prevent damage to the connectors by aligning connector pins before you connect the cable. Misaligned connector pins can cause damage to system components at power-on.
- When disconnecting a cable, always pull on the cable connector or strain-relief loop, not on the cable itself.



Warning:

 This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Appendix 7: Technical support & Warranty

Embest Technology Co., Ltd. established in March of 2000, is a global provider of embedded hardware and software. Embest aims to help customers reduce time to market with improved quality by providing the most effective total solutions for the embedded industry. In the rapidly growing market of high end embedded systems, Embest provides comprehensive services to specify, develop and produce products and help customers to implement innovative technology and product features. Progressing from prototyping to the final product within a short time frame and thus shortening the time to market, and to achieve the lowest production costs possible. Embest insists on a simple business model: to offer customers high-performance, low-cost products with the best quality and service.

7.1 Technical support service

Embest provides one year of free technical support for all products. The technical support service covers:

- Embest embedded platform products software/hardware materials
- Assistance to customers with regards to compiling and running the source code we offer.
- Troubleshooting problems occurring on embedded software/hardware platforms if users have followed the instructions provided.
- Judge whether a product failure exists.

The situations listed below are not covered by our free technical support service, and Embest will handle the situation at our discretion:

- Customers encounter issues related to software or hardware during their development process


- Issues occur when users compile/run the embedded OS which has been modified by themselves.
- Customers encounter issues related to their own applications.
- Customers experience problems caused by unauthorised alteration of our software source code

7.2 Maintenance service clause

1. Product warranty will commence on the day of sale and last 12 months provided the product is used under normal conditions
2. The following situations are not covered by the warranty, Embest will charge service fees as appropriate:
 - Customers fail to provide valid proof of purchase or the product identification tag is damaged, unreadable, altered or inconsistent with the product.
 - Products are subject to damage caused by operations inconsistent with their specification;
 - Products are subject to damage in either appearance or function due to natural disasters (flood, fire, earthquake, lightning strike or typhoon) or natural aging of components or other force majeure;
 - Products are subject to damage in appearance or function due to power failure, external forces, water, animals or foreign materials;
 - Products malfunction due to disassembly or alteration of components by customers, or repair by persons or organizations unauthorized by Embest Technology, or alteration from factory specifications, or configured or expanded with components that are not provided or recognized by Embest Technology;
 - Product failures due to the software or systems installed by customers, inappropriate software settings or computer viruses;
 - Products purchased from unauthorized merchants;

- Embest Technology takes no responsibility for fulfilling any warranty (verbal or written) that is not made by Embest Technology and not included in the scope of our warranty.
- 3. Within the period of warranty, the cost for sending products to Embest should be paid by the customer. The cost for returning the product to the customer will be paid by Embest. Any returns in either direction occurring after the warranty period has expired should be paid for by the customer.
- 4. Please contact technical support with any repair requests.


Note:

 Embest Technology will not take any responsibility for products returned without the prior permission of the company.

7.3 Basic guidelines for protection and maintenance of LCDs

1. Do not use finger nails or other hard sharp objects to touch the surface of the LCD
2. Embest recommends purchasing specialist wipes to clean the LCD after long time use, avoid cleaning the surface with fingers or hands as this may leave fingerprints or smudges.
3. Do not clean the surface of the screen with unsuitable chemicals

Note:

 Embest do not supply a maintenance service for LCDs. We suggest the customer immediately checks the LCD once in receipt of the goods. In the event that the LCD does not run or shows no display, the customer should inform Embest within 7 business days of delivery.

7.4 Value Added Services

We will provide following value added services:

- Driver development based on Embest embedded platforms for devices such as: serial ports, USB interface devices, and LCD screens.
- Control system transplantation, BSP driver development, API software development.
- Other value added services including supply of power adapters and LCD parts.
- Other OEM/ODM services.
- Technical training.

Please contact Embest with any technical support queries:



<http://www.embest-tech.com/contact-us.html>